Specifications for a Tunable Amplified Femtosecond Laser System

The Naval Research Laboratory (NRL), Washington, D.C. has a requirement for a full laser system consisting of amplified Ti:sapphire system with femtosecond optical parametric amplifier. This will be a solid state femtosecond laser system that is tunable within the near infrared and visible portion of the spectrum (from 450 – 1500 nm). The laser system will be used as a source of tunable femtosecond light pulses for a variety of non-linear spectroscopy experiments. The full laser system will include a high-peak-power, regenerative femtosecond titanium:sapphire amplifier (≥5 Gigawatts peak power) with a stable seed oscillator source, and an independent wavelength-tunable femtosecond optical parametric amplifier. The successful offeror shall provide installation and an acceptance test to demonstrate that the system meets NRL's minimum requirements. The laser system must meet or exceed the following minimum specifications:

1.0 Specifications

1.1 Specifications for the complete system:

a) Repetition rate: Adjustable from 10 Hertz to at least 1000 Hertz in increments of no larger than 2 Hertz.

b) Independent wavelength tunable beams based on single sets of optics that access the following wavelength regions with the indicated out put energies at all repetition rates:

Wavelength range	Energy/pulse
450-500 nanometers	≥ 3 microJoules
500-700 nanometers,	≥ 5 microJoules
700-1600 nanometers	≥ 2 microJoules

c) Temporal profile:

Smooth pulses with FWHM ≤ 50 femtoseconds

d) Spatial quality:

M_x^2 ; M_x^2 ≤ 2

e) Pulse width: ≤ 1.4 x time-bandwidth product ($sech^2$).

f) Energy stability:

≤ 1 % rms

g) Beam pointing stability:

The total beam motion is not to exceed 100 microradians.

h) Polarization:

Linearly polarized with a polarization ratio of 100:1 or better.

1.2 Specifications for the primary amplified Titanium/Sapphire laser source:

a) All components in one enclosed box.

b) Active thermal stabilization of the whole amplified laser system.

c) Repetition rate: Adjustable from 10 Hertz to at least 1000 Hertz in increments of no larger than 2 Hertz.

d) Wavelength: Central wavelength between 765 and 810 nm with greater than 600 microJoules/pulse at all repetition rates.

e) Temporal profile:

Smooth pulses with FWHM ≤150 femtoseconds

f) Spatial quality:

M_x^2 ; M_y^2 value of 1.3 or better

g) Pulse width:

≤ 1.4 x time-bandwidth product ($sech^2$)

h) Energy stability:

≤ 1 % rms

i) Beam pointing stability:

The total beam motion shall not exceed 100 microradians.

j) Polarization:

Linearly polarized with a polarization ratio of 100:1 or better.

1.3 Specifications for the optical parametric amplifiers:

a) Repetition rate: Adjustable from 10 Hertz to at least 1000 Hertz by increments of no larger than 2 Hertz

b) Energy

Wavelength range	Energy/pulse
450-500 nanometers	$\geq$ 3 microJoules
500-700 nanometers,	$\geq$ 5 microJoules
700-1600 nanometers	$\geq$ 2 microJoules

c) Temporal profile:

Smooth pulses with FWHM $\leq$ 50 femtoseconds

d) Spatial quality:

M_x^2 ; M_y^2 values of 2 or better

e) Pulse width:

$\leq$ 1.5 x time-bandwidth product ($sech^2$)

f) Energy stability:

$\leq$1% rms

g) Beam pointing stability:

The total beam motion shall not exceed 100 microradians.

h) Polarization:

Linearly polarized with a polarization ration of 100:1 or better.

2.0 Installation and Training

a. The price of the laser system must include delivery of the instrument to NRL, Washington, D.C., and installation at NRL, Washington, D.C. Installation shall include a demonstration that the instrument is in compliance with the specifications.

b. At the completion of the installation and demonstration of the specifications, the successful offeror must provide on-location training at NRL for 2 people for a minimum of one day to familiarize the operators with proper operation and care of the instrument.

3.0 Documentation and Warranty

a. A full set of all written documentation customarily provided to the public with a commercial item shall be provided. This shall include one hard copy of all operations and maintenance manual(s) or equivalent as well as copies of any software, and any manuals for the software included with the system, if customarily provided. This documentation must be received at NRL with the system hardware, unless other arrangements are agreed to by the authorized Government representative.

b. The contractor shall offer the Government at least the same warranty terms, including offers of extended warranties, offered to the general public in customary commercial practice. These warranty terms must be included in the system price. The period of the warranty shall begin upon acceptance.